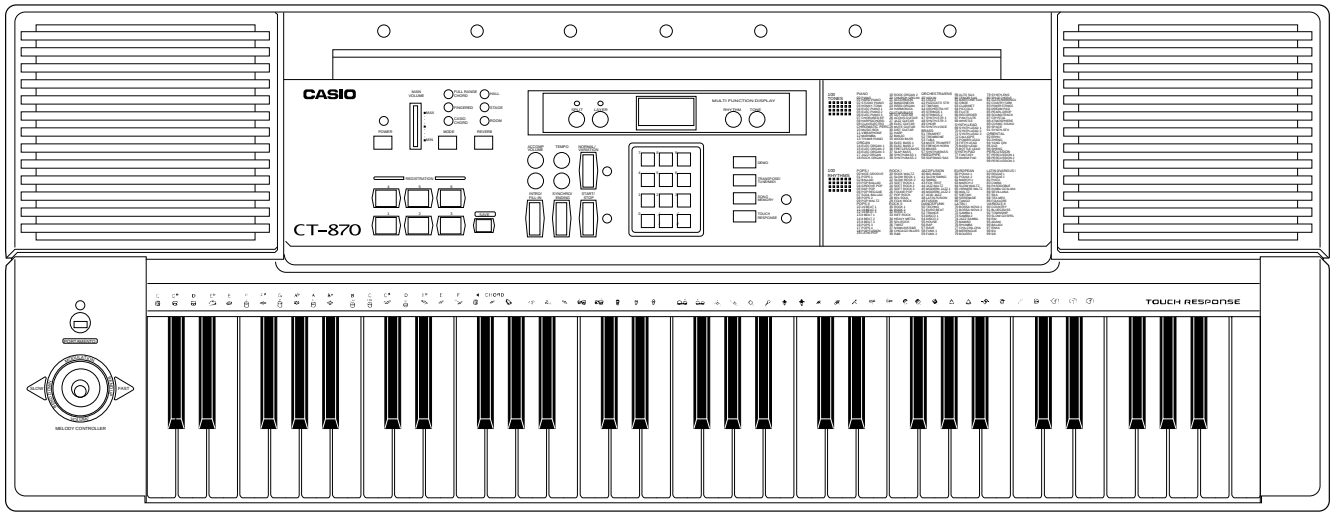
CASIO®

Service Manual

(without price)

CT-870



CT-870

ELECTRONIC KEYBOARD

INDEX

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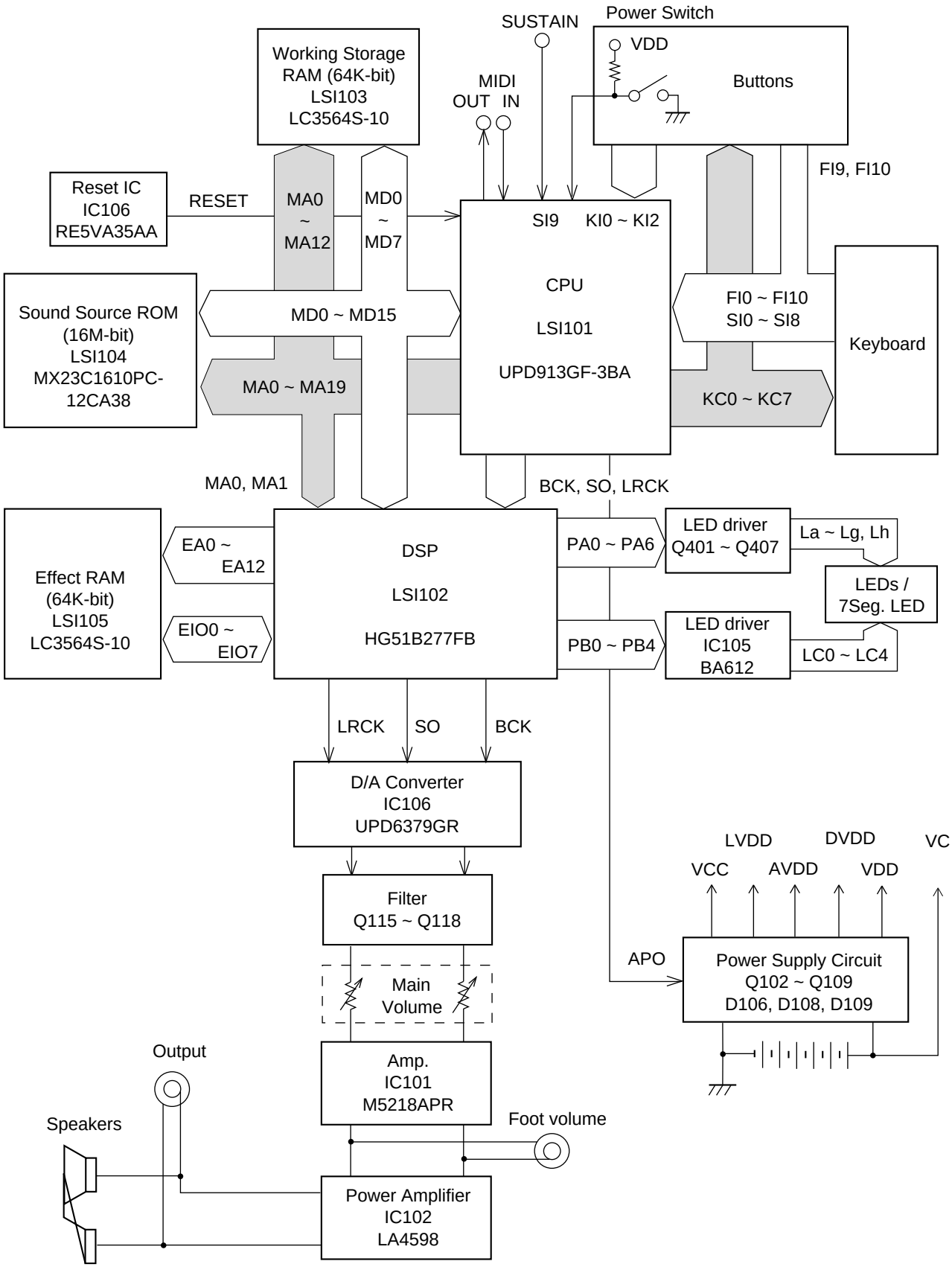
SPECIFICATIONS

GENERAL

Number of keys:	61
Polyphonic:	24-note (12 for some tones)
Preset tones:	100, with split/layer functions
Keyboard controls:	Touch response: On/Off, Key transpose: 12 steps (F#-C-F)
Auto-rhythms:	100, Tempo control: 40 to 255
Auto-accompaniment:	Mode: CASIO Chord/Fingered Chord/Full Range Chord Controller: Intro/Fill-In, Synchro/Ending, Normal/Variation
Reverb effects:	Hall/Stage/Room
Registrations:	6, Parameters registered: Tone No. (Normal, Layer, Split, Layer Split), Rhythm No., Tempo, Accompaniment volume, Chord type, Reverberation type, Split/Layer settings, Pitch bend range, Basic channel, Local on/off, Portamento on/off
Song memory:	1, Real-time recording, Memory capacity: Approx. 1200 notes in total
Demo tunes:	1, including — Mei Wenti (Edward Alstrom)
Tuning control:	440Hz ± 50 cents
Built-in speakers:	12 cm dia. 2.5 W input rating: 2 pcs.
MIDI:	16 multi-channel reception
Terminals:	Phone Jack [Output impedance: 110 Ω, Output voltage: 4.2 V(rms) MAX], Sustain Jack, MIDI Jacks (IN, OUT), AC Adapter Jack (9 V) , Foot volume Jack
Auto power off:	Approximately 6 minutes after the last operation
Power source:	2-way AC or DC source AC: AC adapter DC: 6 D size dry batteries
Power consumption:	7.7 W
Dimensions (HWD):	140 x 997 x 376 mm (5-1/2 x 39-5/16 x 14-13/16 inches)
Weight:	5.4 kg (11.9 lbs) without batteries

BLOCK DIAGRAM

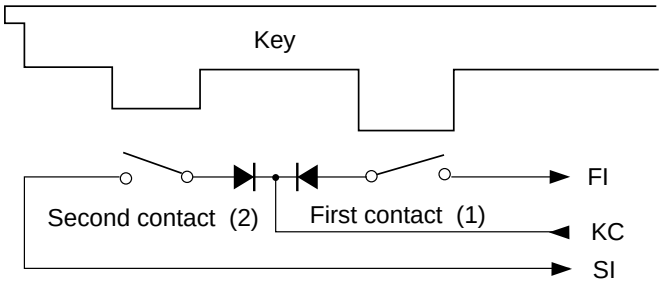


CIRCUIT DESCRIPTION

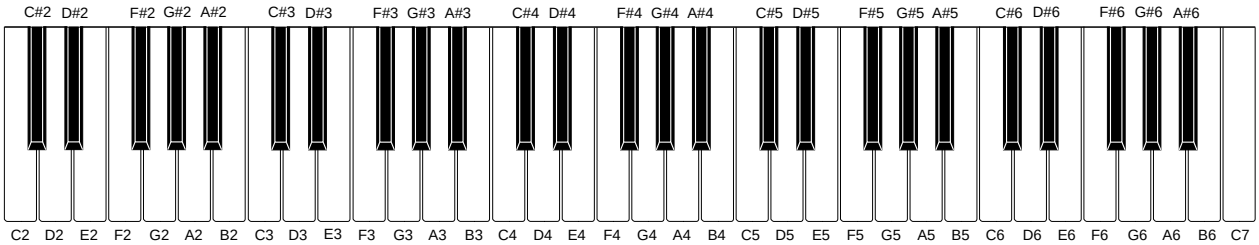
KEY MATRIX

	KC0	KC1	KC2	KC3	KC4	KC5	KC6	KC7
FI0	C2 (1)	C#2 (1)	D2 (1)	D#2 (1)	E2 (1)	F2 (1)	F#2 (1)	G2 (1)
SI0	C2 (2)	C#2 (2)	D2 (2)	D#2 (2)	E2 (2)	F2 (2)	F#2 (2)	G2 (2)
FI1	G#2 (1)	A2 (1)	A#2 (1)	B2 (1)	C3 (1)	C#3 (1)	D3 (1)	D#3 (1)
SI1	G#2 (2)	A2 (2)	A#2 (2)	B2 (2)	C3 (2)	C#3 (2)	D3 (2)	D#3 (2)
FI2	E3 (1)	F3 (1)	F#3 (1)	G3 (1)	G#3 (1)	A3 (1)	A#3 (1)	B3 (1)
SI2	E3 (2)	F3 (2)	F#3 (2)	G3 (2)	G#3 (2)	A3 (2)	A#3 (2)	B3 (2)
FI3	C4 (1)	C#4 (1)	D4 (1)	D#4 (1)	E4 (1)	F4 (1)	F#4 (1)	G4 (1)
SI3	C4 (2)	C#4 (2)	D4 (2)	D#4 (2)	E4 (2)	F4 (2)	F#4 (2)	G4 (2)
FI4	G#4 (1)	A4 (1)	A#4 (1)	B4 (1)	C5 (1)	C#5 (1)	D5 (1)	D#5 (1)
SI4	G#4 (2)	A4 (2)	A#4 (2)	B4 (2)	C5 (2)	C#5 (2)	D5 (2)	D#5 (2)
FI5	E5 (1)	F5 (1)	F#5 (1)	G5 (1)	G#5 (1)	A5 (1)	A#5 (1)	B5 (1)
SI5	E5 (2)	F5 (2)	F#5 (2)	G5 (2)	G#5 (2)	A5 (2)	A#5 (2)	B5 (2)
FI6	C6 (1)	C#6 (1)	D6 (1)	D#6 (1)	E6 (1)	F6 (1)	F#6 (1)	G6 (1)
SI6	C6 (2)	C#6 (2)	D6 (2)	D#6 (2)	E6 (2)	F6 (2)	F#6 (2)	G6 (2)
FI7	G#6 (1)	A6 (1)	A#6 (1)	B6 (1)	C7 (1)			
SI7	G#6 (2)	A6 (2)	A#6 (2)	B6 (2)	C7 (2)			
FI9	Intro/ Fill-In	Synchro/ Ending	Portament	Start/ Stop	Registration 1	Registration 2	Registration 3	Registration 4
FI10	Registration 5	Registration 6	Save	Normal/ Variation	Tempo Up	Tempo Down	Accomp. Volume Up	Accomp. Volume Down
KI0	Mode	Rhythm	0	1	4	7	Layer	Split
KI1	Reverb	Tone	–	2	5	8	Transpose Tune/MIDI	Demo
KI2			+	3	6	9	Song Memory	Touch Response

Note: Each key has two contacts,
the first conatct (1) and second contact (2).



NOMENCLATURE OF KEYS



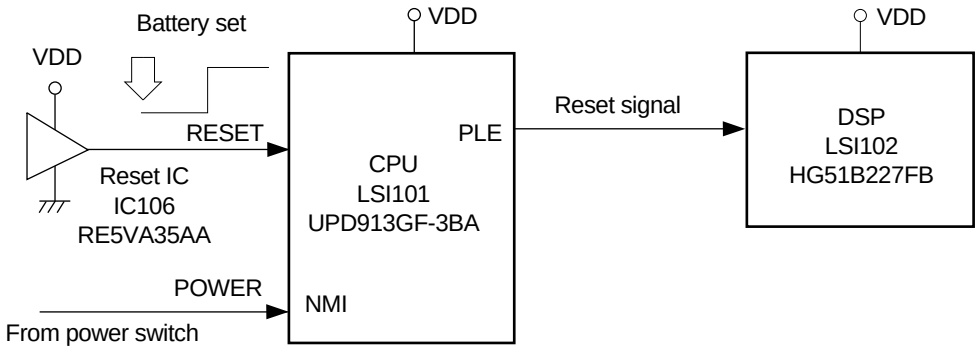
POWER SUPPLY CIRCUIT

The power supply circuit generates six voltages as shown in the following table. VDD voltage is always generated. The others are controlled by APO signal from the CPU.

Name	Voltage	For operation of
VDD	+5 V	CPU, Reset IC, DSP, Sound source ROM, Working storage RAM, Effect RAM
DVDD	+5 V	Power jack, Sustain jack, MIDI jack
AVDD	+5 V	DAC, Filter
LVDD	+5 V	LED Driver
VCC	+9 V	Power amplifier, Pilot lamp
VC	+9 V	Power amplifier

RESET CIRCUIT

When batteries are set or an AC adapter is connected, the reset IC provides a low pulse to the CPU. The CPU then initializes its internal circuit, and clears the working storage RAM.
When the power switch is pressed, the CPU receives a low pulse of POWER signal, then the CPU sends a reset signal to the DSP.



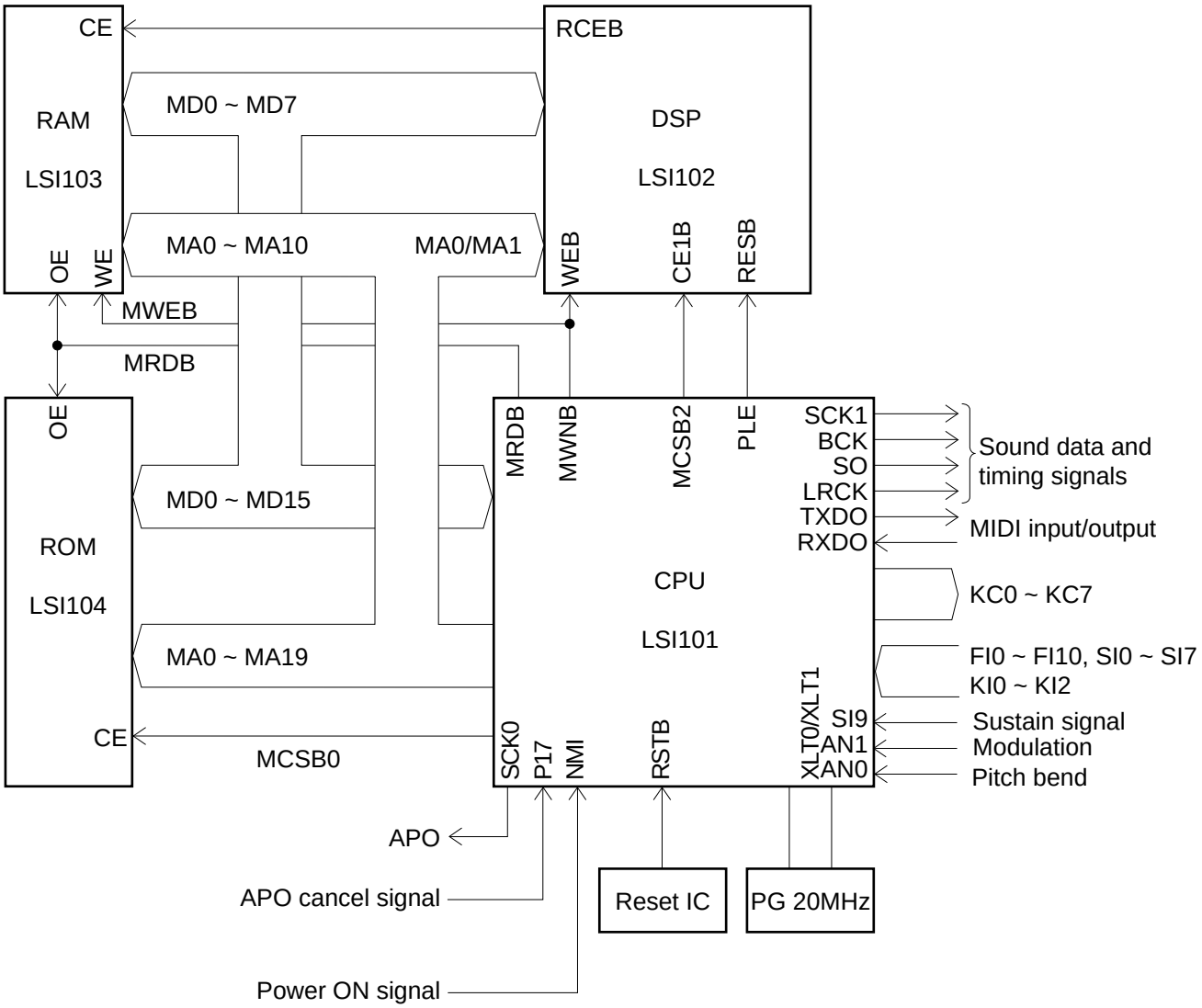
CPU (LSI101: UPD913GF-3BA)

The 16-bit CPU contains a 1k-byte RAM, three 8-bit I/O ports, two timers, a keycontroller and serial interfaces. The CPU detects key velocity by counting the time between first-key input signal FI and second-key SI from the keyboard. The CPU reads sound data and velocity data from the sound source ROM in accordance with the selected tone; the CPU can read rhythm data simultaneously when a rhythm pattern is selected. Then the CPU provides 16-bit serial sound data to the DSP. The CPU also controls MIDI input/output and stores sequencer data into the working storage RAM.
The following table shows the pin functions of LSI101.

Pin No.	Terminal	In/Out	Function
1	TXD0	Out	MIDI signal output
2	RXD0	In	MIDI signal input
3	SCK0	Out	APO (Auto Power Off) signal output
4, 5	TXD1, RXD2	—	Not used. Connected to ground.
6	SCK1	Out	1 MHz synchronizing pulse output
7	AVCC	In	+5 V source
8	AN0	In	Pitch bend control voltage input
9	AN1	In	Modulation control voltage input
10	AGND	In	Ground (0 V) source
11	BCK	Out	Bit clock output
12	SO	Out	Serial sound data output
13	LRCK	Out	Word clock output
14	GND	In	Ground (0 V) source
15, 16	XLT0, XLT1	In/Out	20 MHz clock input/output
17	VCC	In	+5 V source
18, 19	MD0, MD1	In	Mode selection terminal
20	RSTB	In	Reset signal input
21	NMI	In	Power ON signal input
22	INT	—	Not used. Connected to ground.
23 ~ 30	FI0 ~ FI3 SI0 ~ SI3	In	Terminal for key input signal
31 ~ 38	KC0 ~ KC7	Out	Terminal for key input signal
39 ~ 46	FI4 ~ FI7 SI4 ~ SI7	In	Terminal for key input signal
47, 48	FI8, SI8	—	Not used
49	FI9	In	Terminal for button input signal
50	SI9	In	Substain signal input
51	FI10	In	Terminal for button input signal
52	SI10	In	Not used
53 ~ 55	KI0 ~ KI2	In	Terminal for button input signal
56	MWNB	Out	Write enable signal output
57 ~ 76	MA0 ~ MA17	Out	Address bus
77	MCSB0	Out	Chip enable signal output for the sound source ROM
78	MCSB1	Out	Not used
79	MCSB2	Out	Chip enable signal output for the DSP

Pin No.	Terminal	In/Out	Function
80	VCC	In	+5 V source
81	GND	In	Ground (0 V) source
82	MRDB	Out	Read enable signal output
83 ~ 98	MD0 ~ MD15	In/Out	Data bus
99	PLE	Out	Reset signal output for the DSP
100	P17	In	APO cancellation signal input

CPU Block Diagram

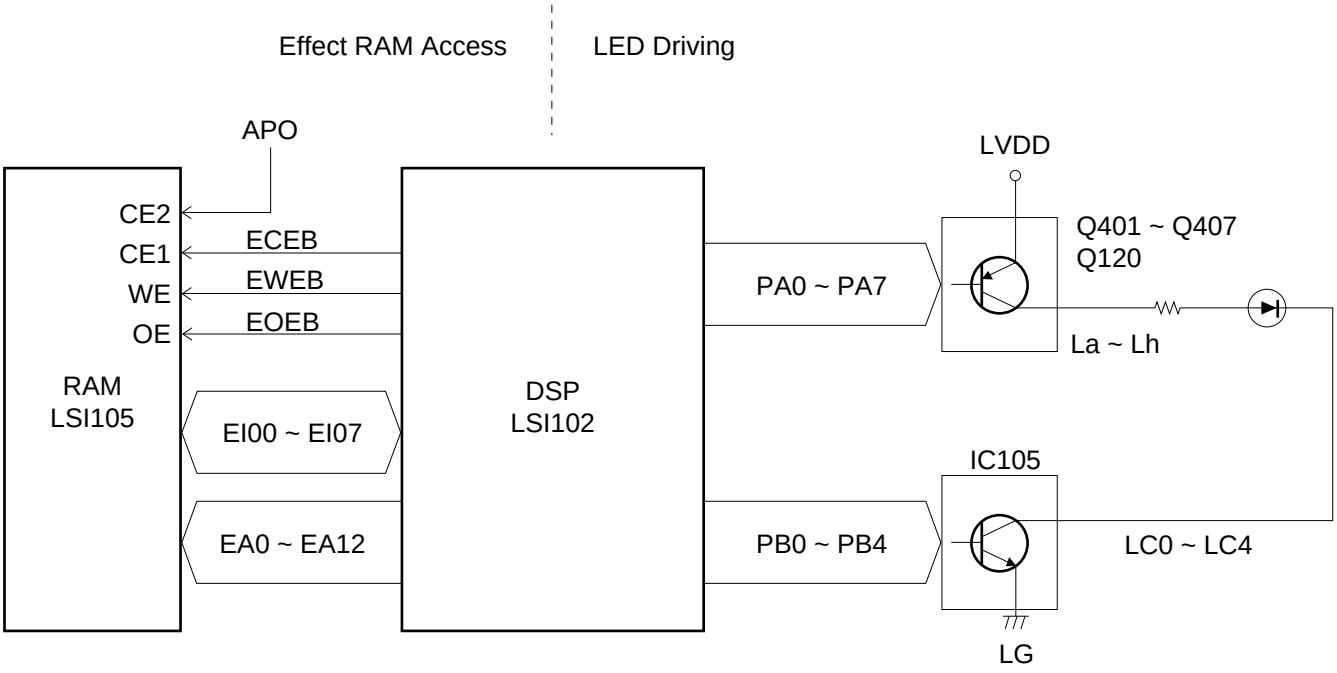


DIGITAL SIGNAL PROCESSOR (LSI102: HG51B277FB)

The DSP receives 16-bit serial sound data output from the CPU and adds the selected effect to the sound data using the effect RAM. Then the DSP provides the sound data to the DAC. The DSP contains two I/O ports, which controls LEDs.
The following table shows the pin functions of LSI102.

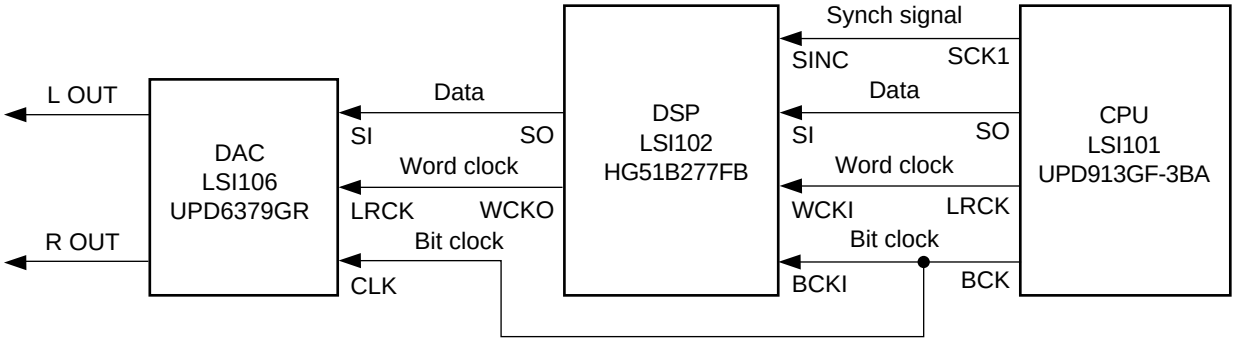
Pin No.	Terminal	In/Out	Function
1 ~ 4, 80	PB0 ~ PB4	Out	LED drive signal output
5	SO	Out	Serial sound data output for the DAC
6	WCKO	Out	Word clock output for the DAC
7	VDD3	In	+5 V source
8	TEST	—	Not used.
9	RESB	In	Reset signal input
10	VSS2	In	Ground (0 V) source
11, 12	XIN, XOUT	In/Out	16 MHz clock input/output
13	WCKI	In	Word clock input from the CPU
14	SI	In	Serial sound data input from the CPU
15	BCKI	In	Bit clock input from the CPU
16	SINC	In	1 MHz synchronizing pulse input
17	VDD2	In	+5 V source
18 ~ 25	IO0 ~ IO7	In/Out	Data bus
26	RCEB	Out	Chip enable signal output for the working storage RAM
27	VSS3	In	Ground (0 V) source
28	AD1	In	Address bus
29	OEB	In	Not used. Connected to +5 V source.
30	WEB	In	Write enable signal input
31	VDD3	In	+5 V source
32	CE2	In	Chip enable signal input. High active.
33	AD0	In	Address bus
34	CE1B	In	Chip enable signal input. Low active.
35 ~ 41, 43	EIO0 ~ EIO7	In/Out	Data bus for the effect RAM
42, 44, 46 ~ 48, 51 ~ 57, 59	EA0 ~ EA12	Out	Address bus for the effect RAM
45	ECEB	Out	Chip enable signal output for the effect RAM
49	EOEB	Out	Read enable signal output for the effect RAM
50	VSS3	In	Ground (0 V) source
58	EA13	Out	Not used
60	EWEB	Out	Write enable signal output for the effect RAM
61	EA14	Out	Not used
62, 66, 70, 74, 78	VSS2	In	Ground source
63, 67, 71, 75, 79	VDD2	In	+5 V source
64, 65, 68, 69, 72, 73, 76, 77	PA0 ~ PA7	Out	LED segment signal output

DSP Block Diagram



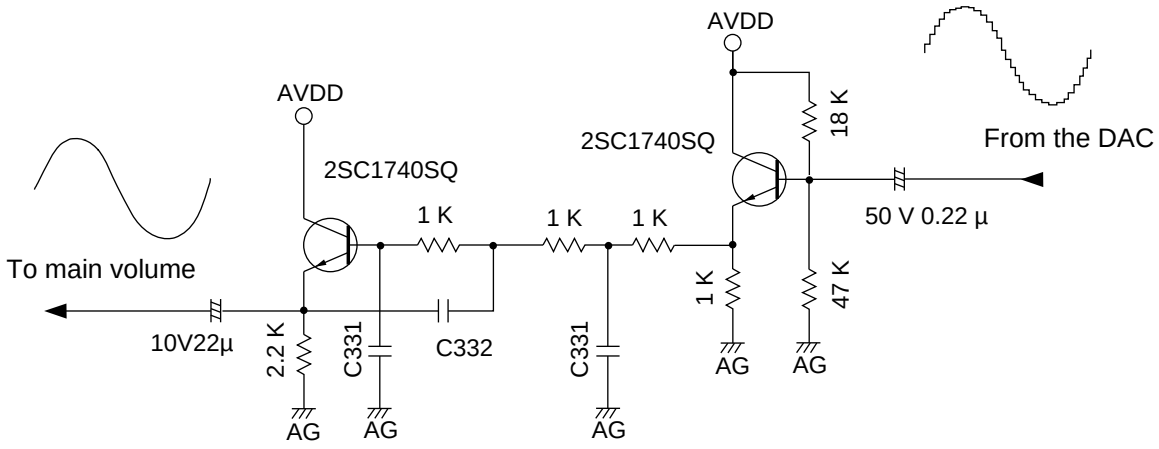
DAC (LSI106: UPD6379GR)

The DAC receives 16-bit serial data output from the DSP. The data contains digital sound data of the melody, chord, bass, and percussion for the right and left channels. The DAC converts the data into analog waveforms and output them to each channel separately.



FILTER BLOCK

Since the sound signals from the DAC are stepped waveforms, the filter block is added to smooth the waveforms.

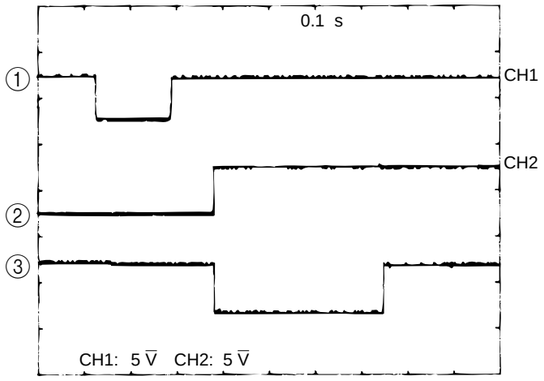


POWER AMPLIFIER (IC102: LA4598)

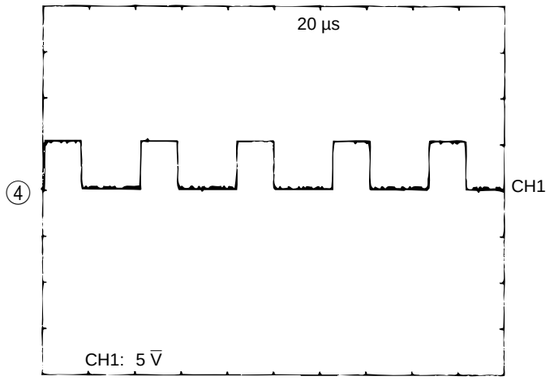
The power amplifier is a two-channel amplifier with standby switch.
The following table shows the pin function of IC101.

Pin No.	Terminal	In/Out	Function
1	Power GND	In	Ground (0 V) source
2	Ch1 B.S.	—	Terminal for a bootstrap capacitor
3	Ch1 OUT	Out	Channel 1 output
4	VCC	In	+9 V source
5	Ch1 N.F.	In	Negative feedback input
6	Ch1 IN	In	Channel 1 input
7	D.C.	—	Terminal for a decoupling capacitor
8	Pre GND	In	Ground (0 V) source
9	Stand by	In	Power control signal input. 0 V: Off, +9 V: On
10	Ch2 IN	In	Channel 2 input
11	Ch2 N.F.	In	Negative feedback input
12	Ch2 OUT	Out	Channel 2 output
13	Ch2 B.S.	—	Terminal for a bootstrap capacitor
14	NC	—	Not used

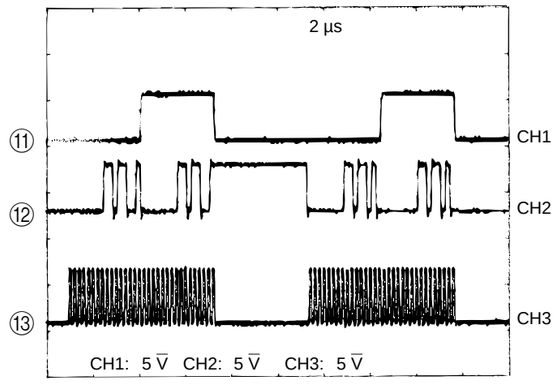
MAJOR WAVEFORMS



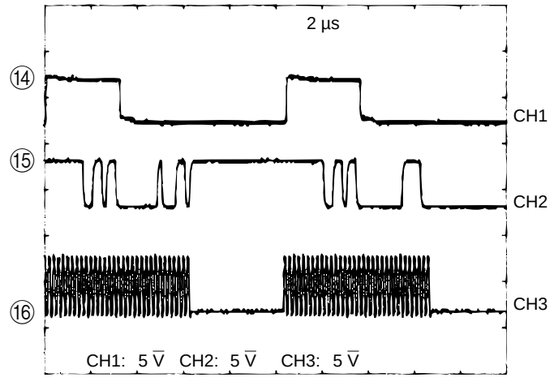
① POWER ON signal
UPD913GF-3BA pin 21
② APO signal
UPD913GF-3BA pin 3
③ Reset signal for the DSP
UPD913G-3BA pin 99



④ Synchronizing pulse
UPD913GF-3BA pin 6

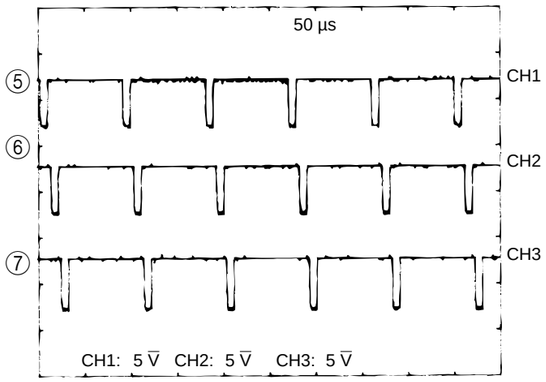


⑪ Word clock LRCK
UPD913GF-3BA pin 13
⑫ Data signal SO
UPD913GF-3BA pin 12
⑬ Bit clock BCK
UPD913GF-3BA pin 11

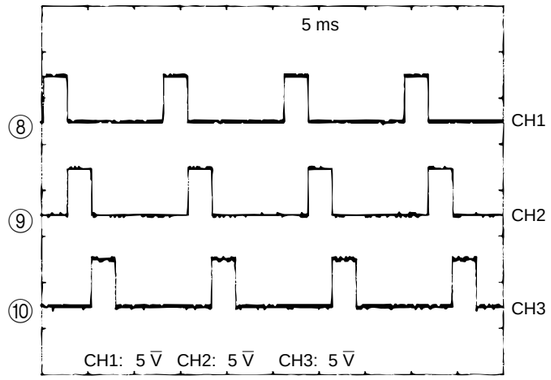


⑭ Word clock LRCK
UPD6379GR pin 1
⑮ Data signal SI
UPD6379GR pin 2
⑯ Bit clock CLK
UPD6379GR pin 3

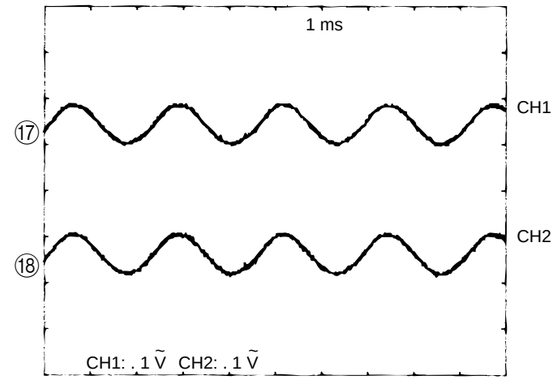
Note: On



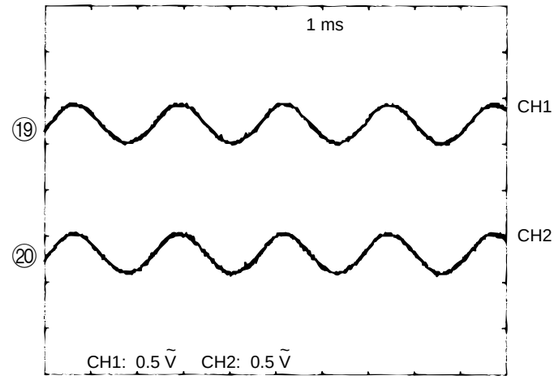
⑤ Key scan signal KC0
UPD913GF-3BA pin 31
⑥ Key scan signal KC1
UPD913GF-3BA pin 32
⑦ Key scan signal KC2
UPD913GF-3BA pin 33



⑧ LED drive signal PB0
HG51B227FB pin 80
⑨ LED drive signal PB1
HG51B227B pin 1
⑩ LED drive signal PB2
HG51B227FB pin 2



⑰ DAC output (R-ch)
UPD6379GR pin 5
⑱ DAC output (L-ch)
UPD6379GR pin 8

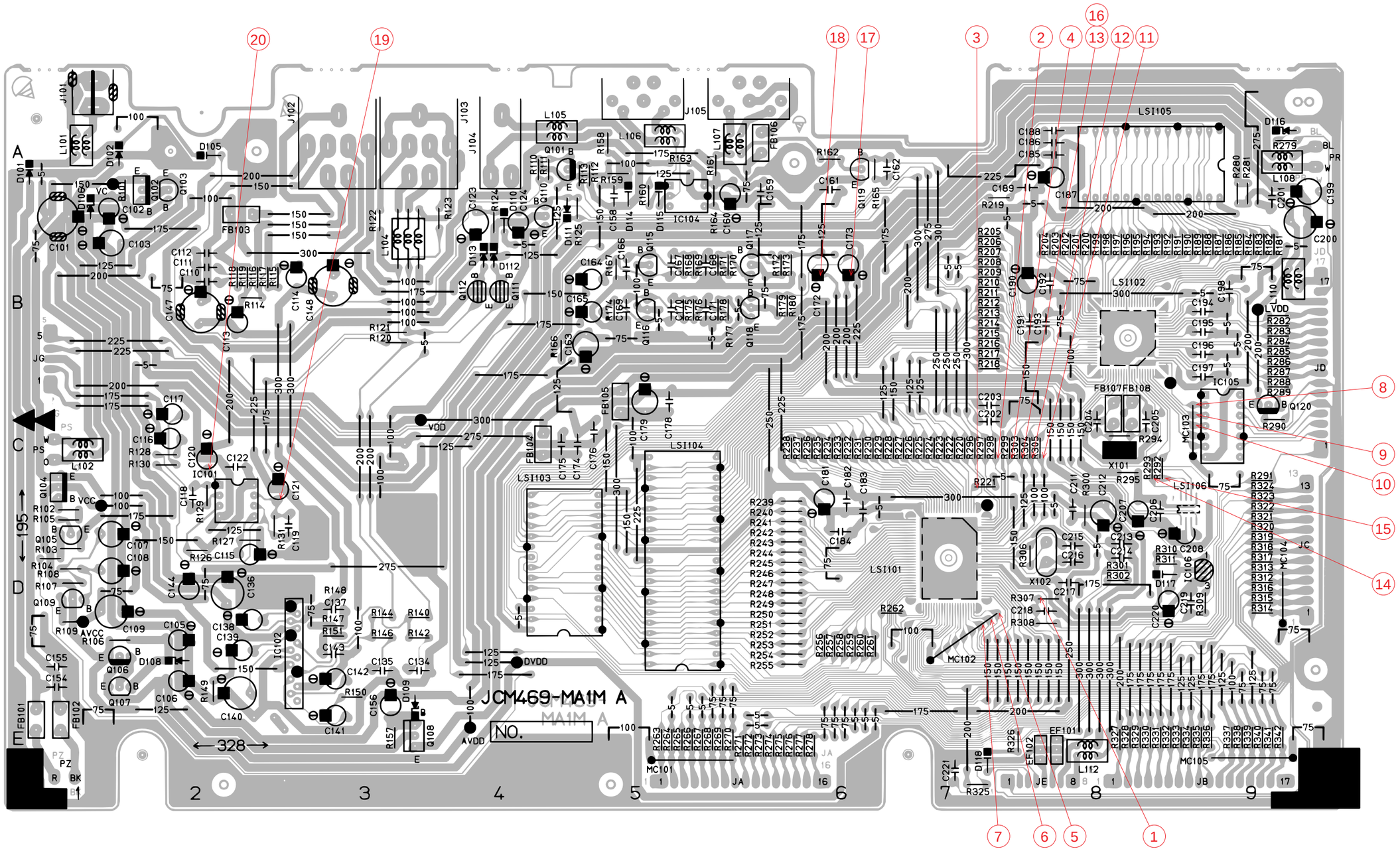


⑲ Pre-amp. output (R-ch)
M5218APR pin 7
⑳ Pre-amp. output (L-ch)
M5218APR pin 1

Tone : Whistle (68)
Key : A4
Touch response : Off
Reverb : Off
Volume : Maximum

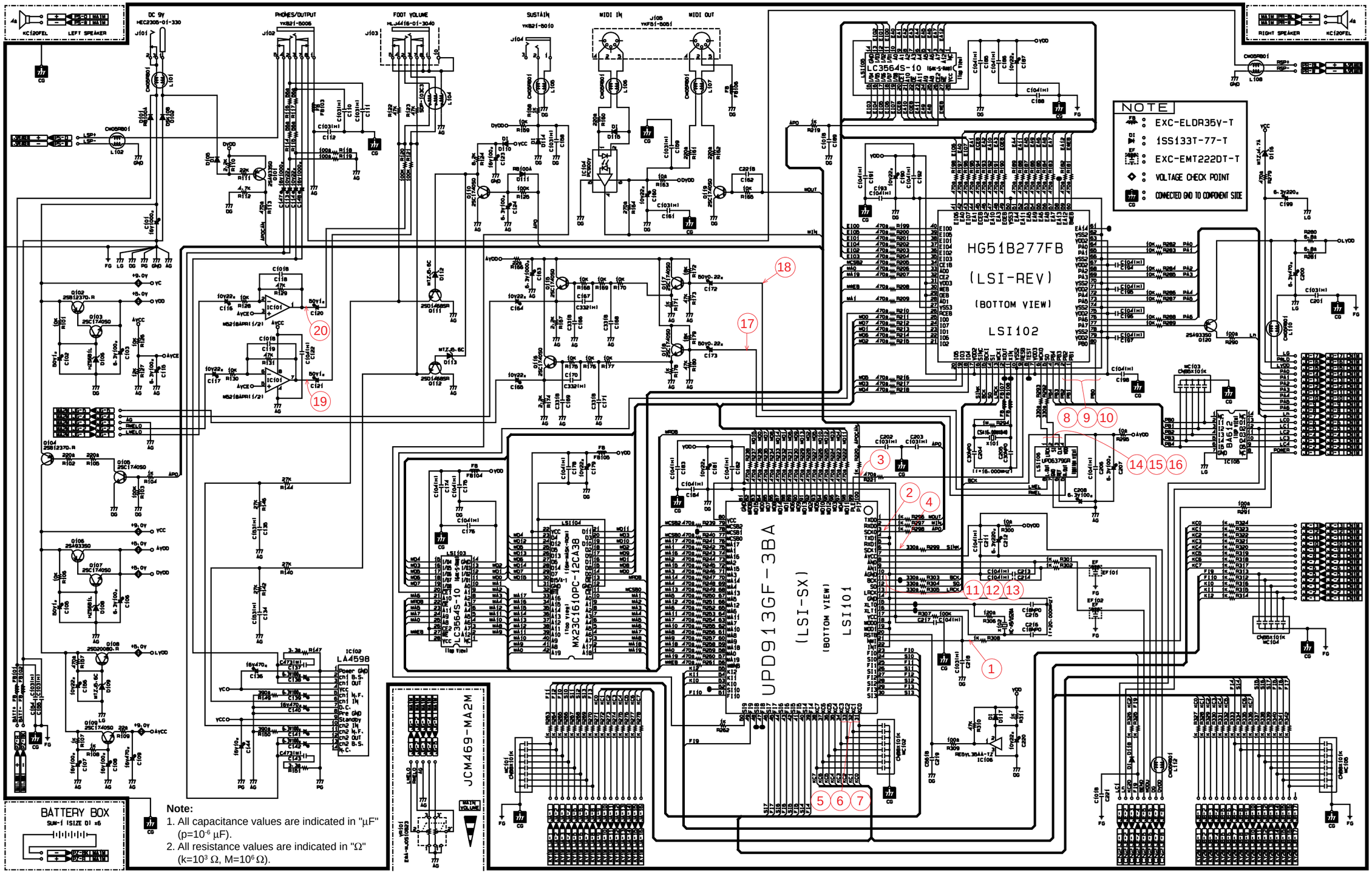
PRINTED CIRCUIT BOARD

Main PCB JCM469-MA1M

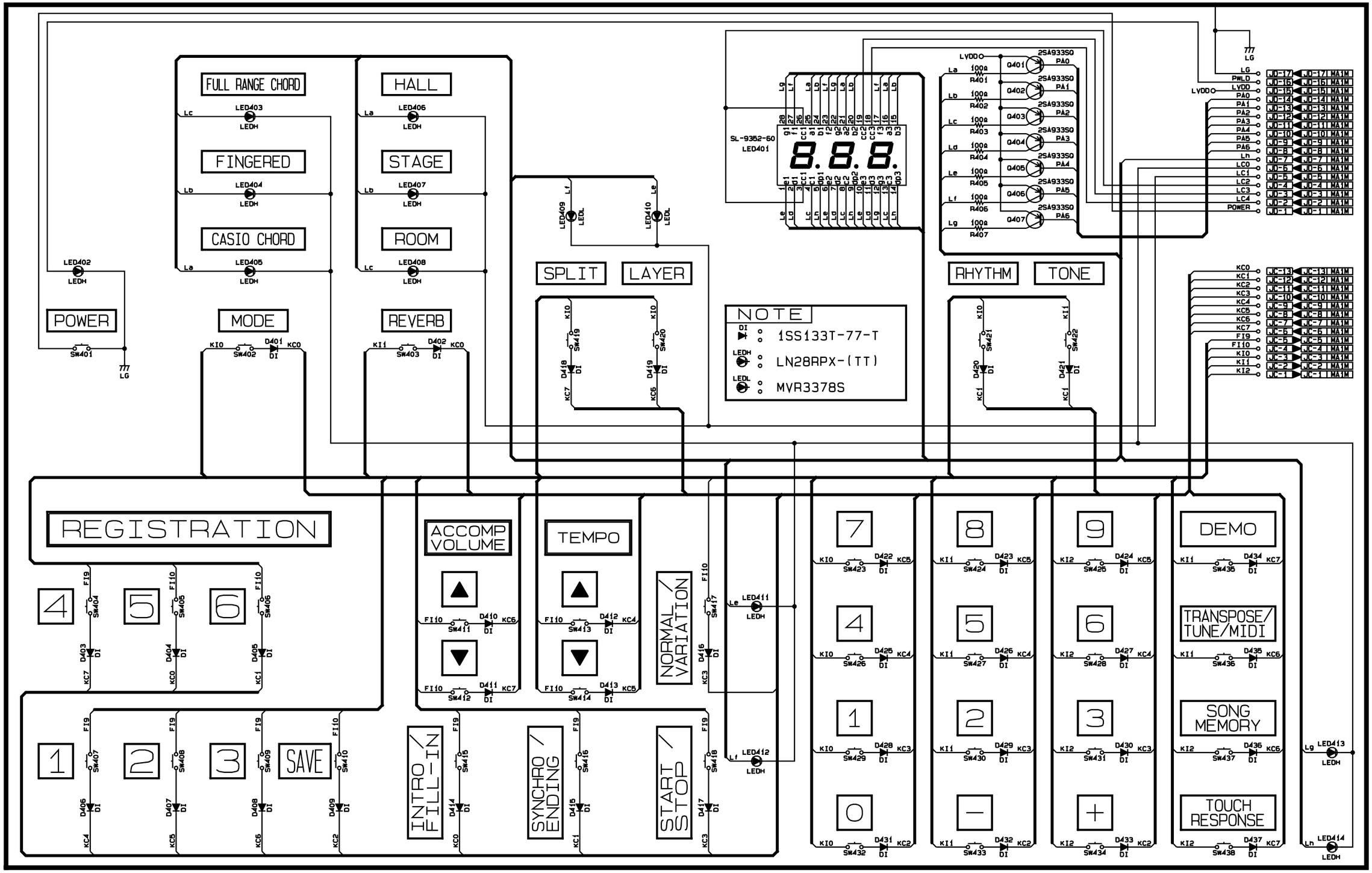


SCHEMATIC DIAGRAMS

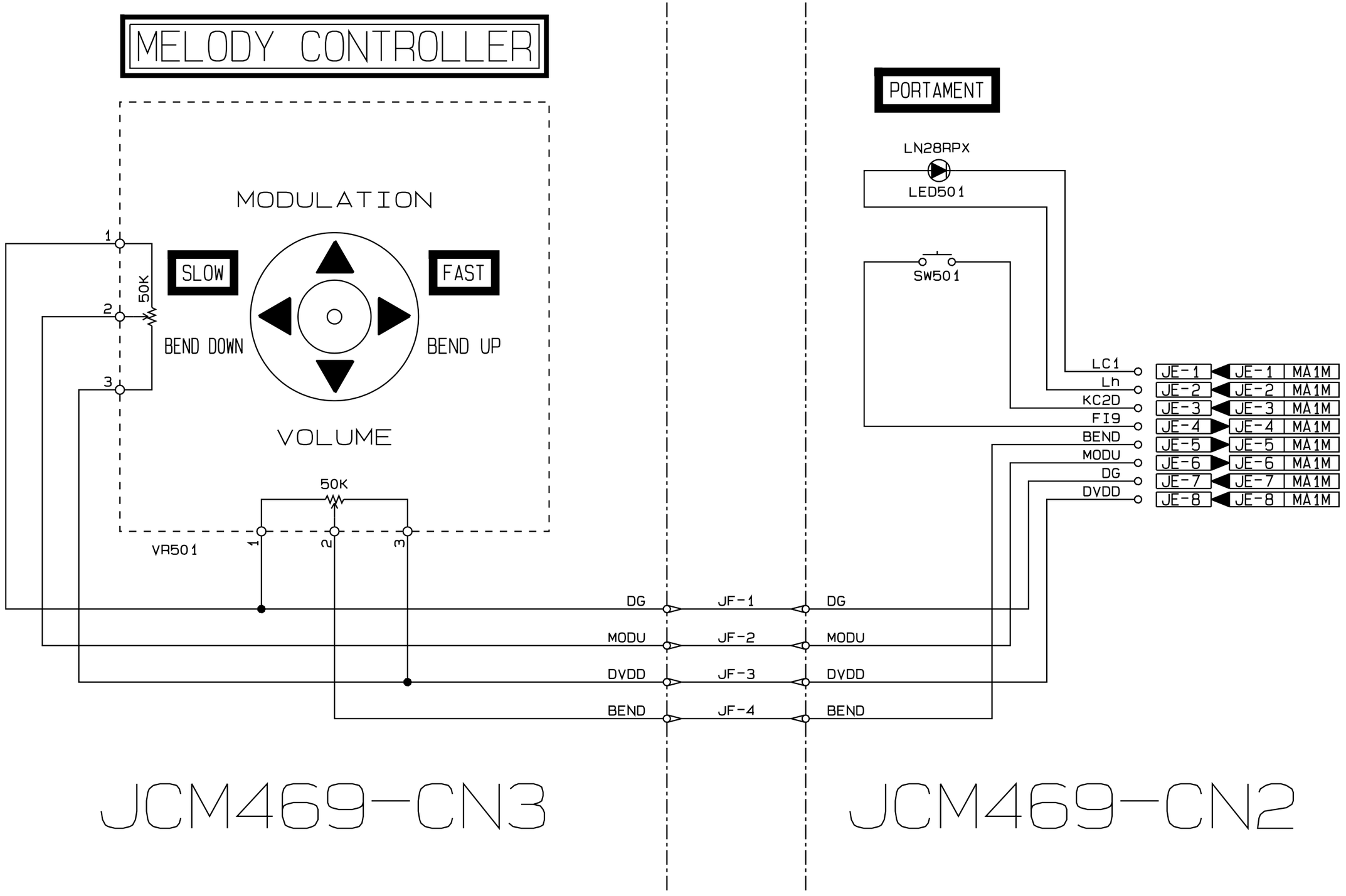
Main PCB JCM469-MA1M/MA2M



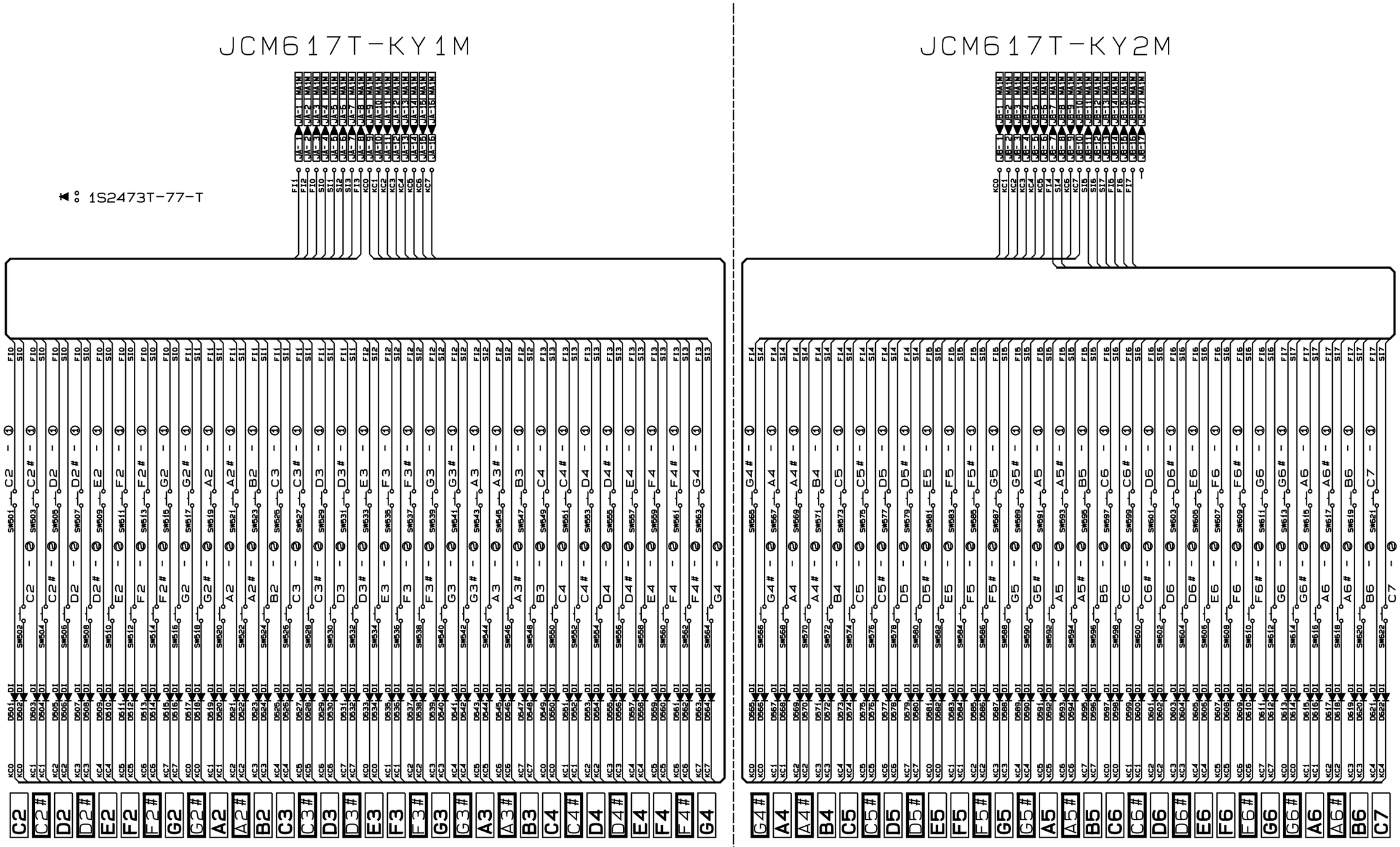
Console PCB JCM469-CN1M



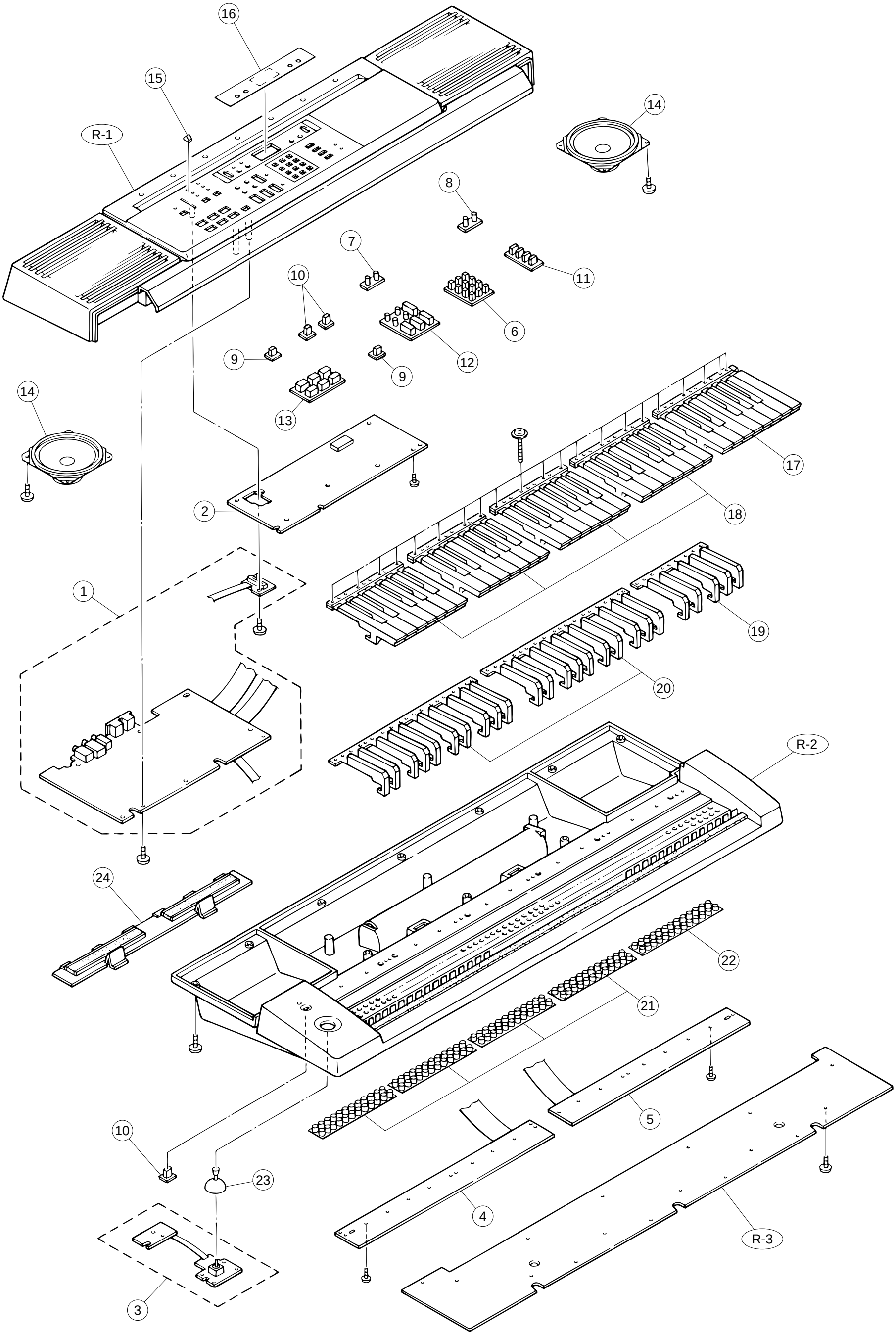
Controller PCBs JCM469-CN2/CN3



Keyboard PCBs JCM617T-KY1M/KY2M



EXPLODED VIEW



PARTS LIST

CT-870

Notes: This parts list does not include the cosmetic parts, which parts are marked with item No. "R-X" in the exploded view.
Contact our spare parts department if you need these parts for refurbish.

1. Prices and specifications are subject to change without prior notice.

2. As for spare parts order and supply, refer to the "GUIDEBOOK for Spare parts Supply", published seperately.

3. The numbers in item column correspond to the same numbers in drawing.

Item	Code No.	Parts Name	Specification	Q	R
	Main PCB				
1	6925 4800	Main PCB ass'y M469-MA1.2M	M140392*1	1	B
LSI101	2012 3668	LSI, CPU	UPD913GF-3BA	1	A
LSI102	2012 0441	LSI, DSP	HG51B277FB	1	A
LSI103/105	2012 0700	LSI, RAM	LC3564S-10	2	A
LSI104	2012 3661	LSI, ROM	MX23C1610PC-12C38	1	A
LSI106	2105 4249	LSI, DAC	UPD6379GR	1	A
IC101	2114 1799	IC	M5218APR	1	A
IC102	2114 2891	IC	LA4598	1	A
IC104	2114 1421	IC	PC900V	1	A
IC105	2114 3318	IC	BA612	1	A
IC106	2105 3941	IC	RE5VL35AA-TZ	1	A
Q101, Q106, Q120	2200 4409	Transistor	2SA933SQ-TP-T	3	A
Q102/104	2251 0469	Transistor	2SB1237Q,R-TV6-T	2	A
	2220 1387	Transistor	2SC1740SQ-TP-T	10	A
Q108	2253 0357	Transistor	2SD2008Q,R-T105-T	1	A
Q111/112	2253 0420	Transistor	2SD1468SR,S-TP-T	2	A
D101/111	2390 1323	Diode	RB100A-T32-T	2	B
D102	2390 0371	Diode	DSK10B-BT-T	1	B
	2390 1344	Diode	1SS133T-77-T	6	B
D106, D108	2360 1085	Zener diode	HZS6B1LTD-T	2	B
D109, D112/113	2360 1646	Zener diode	MTZJ5.6CT-77-T	3	B
D116	2360 2079	Zener diode	MTZJ4.7AT-77-T	1	B
X101	2590 0203	Ceramic oscillator	CSA16.00MX040	1	B
X102	2590 2009	Crystal oscillator	HC-49/US20A	1	B
J101	3501 7049	Jack	HEC2305-01-330	1	B
J102	3612 0665	Jack	YKB21-5006	1	B
J103	3613 0938	Jack	HLJ4416-01-3040	1	B
J104	3612 0789	Jack	YKB21-5010	1	B
J105	3501 4816	Jack	YKF51-5051	1	B
VR101	2765 1575	Volume	EWA-MJ0S10B23	1	A
	Console PCB				
2	6925 4810	Console PCB ass'y M469-CN1M	M140393*1	1	B
Q401 - Q407	2200 4409	Transistor	2SA933SQ-TP-T	7	B
	2390 1344	Diode	1SS133T-77-T	37	B
LED401	2370 1141	LED	SL-9352-60	1	B
	2370 0616	LED	LN28RPX-(TT2)	11	C
LED409/410	2370 1190	LED	MVR3378S	2	C
	Controller PCBs				
3	6925 4820	Controller PCB ass'y M469-CN2.3	M240412*1	1	B
	2370 0616	LED	LN28RPX-(TT2)	1	C
	3502 2180	Stick controller	RKJXK1220-9-50K	1	A
	Keyboard PCBs				
4	6923 6940	PCB ass'y M617T-KY1M	M140211*1	1	B
D501 - D564	2301 0101	Diode	1S2473-T-77-T	64	C
5	6923 6950	PCB ass'y M617T-KY2M	M140212*1	1	B
D565 - D622	2301 0101	Diode	1S2473-T-77-T	58	C
	Mechanical Parts				
6	6906 8291	Rubber button	M312088-5	1	B
7	6922 2680	Rubber button	M312082-2	1	B
8	6925 4960	Rubber button	M312082-4	1	B
9	6923 4980	Rubber button	M312122-2	2	B
10	6923 4990	Rubber button	M312123-2	3	B

Notes: Q – Used quantity
R – Rank

Item	Code No.	Parts Name	Specification	Q	R
11	6925 4970	Rubber button	M312125-4	1	B
12	6925 4980	Rubber button	M240099-2	1	B
13	6925 4990	Rubber button	M240403-1	1	B
14	3831 0413	Speaker	KC120FEL	2	B
15	6921 5040	Slide knob	M311860-1	1	B
16	6925 4920	Display plate	M340457-1	1	C
17	6922 2860	White key set, CS	M340503*2	1	A
18	6922 2850	White key set, CB	M340503*1	4	A
19	6922 2750	Black key set, 5-key	M111726-2	1	A
20	6922 2740	Black key set, 10-key	M111726-1	2	A
21	6922 2760	Key contact rubber	M211704-1	4	A
22	6922 2770	Key contact rubber	M211705-1	1	A
23	6925 2570	Control stick	M340475-1	1	A
24	6918 1630	Battery cover	M311164*1	1	B
	Accessories				
	1014 9396	AC adapter (for China only)	AD-5CL-SC1(D)	1	B
	6925 4890	Console sheet (for China only)	M140380-1	1	B

Notes: Q – Used quantity
R – Rank

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